

Difference Between Aplastic Anemia and Leukemia

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Key Difference – Aplastic Anemia vs Leukemia

Leukemia can be defined as the accumulation of abnormal malignant monoclonal **white blood cells** in the **bone marrow**. From the name itself, you can understand that leukemia is a type of malignancy. Pancytopenia with hypercellularity (aplasia) of the bone marrow is identified as aplastic anemia. The key difference between aplastic anemia and leukemia is the presence or absence of absence of any cancerous, leukemic or abnormal cells; **leukemia is characterized by the presence of cancerous, leukemic or abnormal cells in the peripheral blood or bone marrow whereas aplastic anemia is not.**

What is Aplastic Anemia?

Pancytopenia with hypercellularity (aplasia) of the bone marrow can be defined as aplastic anemia. In this condition, no leukemic, cancerous or other abnormal cells are found either in the peripheral blood or bone marrow. Reduction in the number of **pluripotent** stem cells together with defects in the remaining or abnormal immune response against them can result in aplastic anemia. This condition can evolve into myelodysplasia, paroxysmal nocturnal hemoglobinuria or AML in some cases.

Etiology

Immune mechanisms play a major role in a majority of cases. Bone marrow failure is caused by the activated **cytotoxic T cells** in blood and bone marrow. Bone marrow aplasia may occur due to cytotoxic drugs such as busulfan and doxorubicin. But some non-cytotoxic drugs such as chloramphenicol, gold, carbimazole, chlorpromazine, phenytoin, ribavirin, tolbutamide, and NSAIDs also have the potential to bring about aplasia in some individuals.

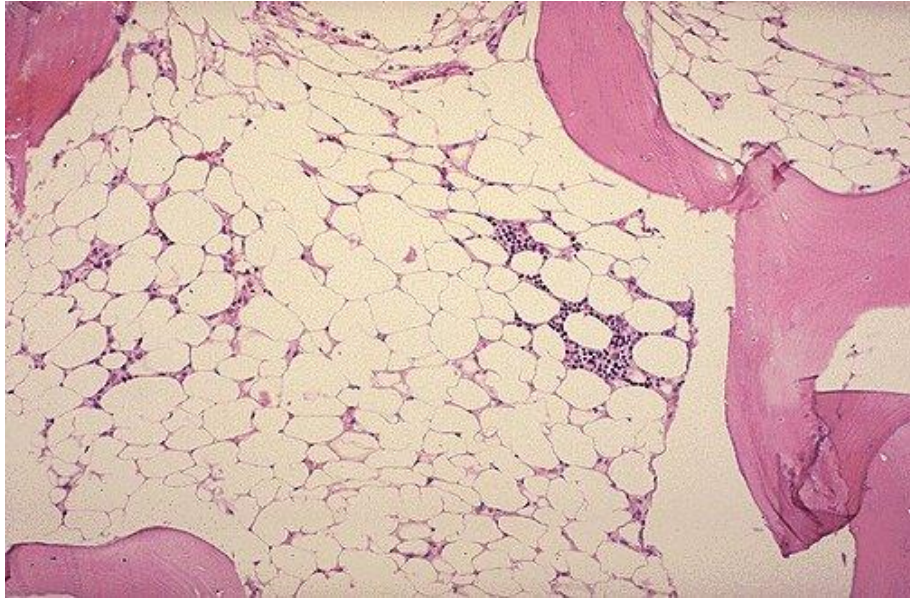


Figure 01: Aplastic Anemia in bone marrow

Clinical Features

- [Anemia](#)
- Bleeding and bruising
- [Infections](#)
- Ecchymoses
- Bleeding gums and epistaxis

Investigations

- Blood count-Hemoglobin levels are reduced.
- Blood film-No abnormal cells, Reticulocyte count is extremely low, Platelets are small in size.

Management

Treatment of aplastic anemia depends on the underlying cause. Close attention should be given to supportive therapy while waiting for the bone marrow recovery. Supportive treatments include RBC transfusion, platelet transfusion, and granulocyte transfusion. Prompt prevention of infection is extremely important. For patients with severe aplastic anemia under the age of 40, the treatment of choice is hemopoietic stem cells.

What is Leukemia?

Leukemia can be defined as the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow. This results in bone marrow failure, causing anemia, neutropenia, and thrombocytopenia. Normally, the proportion of blast cells in the adult bone marrow is less than 5%. But in the leukemic bone marrow, this proportion is over 20%.

There are 4 basic subtypes of leukemia as,

- Acute myeloid leukemia(AML)
- Acute lymphoblastic leukemia(ALL)
- Chronic myeloid leukemia(CML)
- Chronic lymphocytic leukemia(CLL)

These diseases are relatively uncommon and the annual incidence of them is 10/1000000. Usually, leukemia can occur at any age. But ALL is predominantly seen in the childhood whereas CLL frequently occurs in the elderly. Etiological agents causing leukemia include radiation, viruses, cytotoxic agents, immunosuppression and genetic factors. Diagnosis of the disease can be done by the examination of a stained slide of peripheral blood and bone marrow. For sub-classification and prognostication, immunophenotyping, [cytogenetics](#), and [molecular genetics](#) are essential.

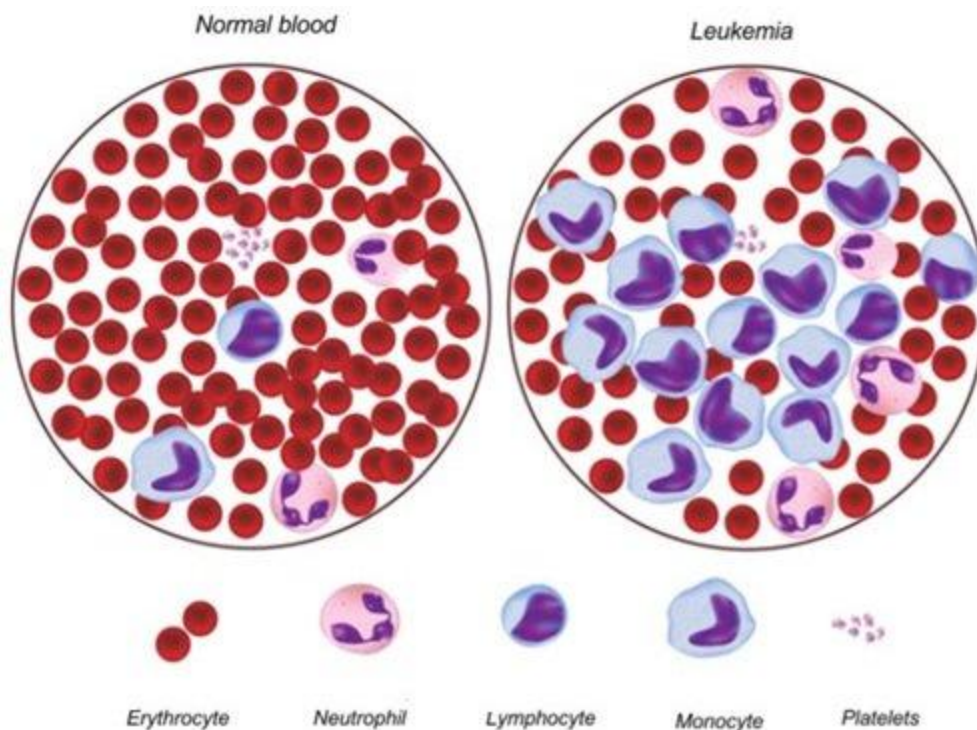


Figure 02: Leukemia

Acute Leukemia

The incidence of **acute leukemia** increases with advancing age. The median age of presentation for acute myeloblastic leukemia is 65 years. Acute leukemia may arise de novo or due to prior cytotoxic **chemotherapy** or myelodysplasia. Acute lymphoblastic leukemia has a lower median age of presentation. It is the most common malignancy in the childhood.

Clinical Features of ALL

- Breathlessness and fatigue
- Bleeding and bruising
- Infections
- Headache/confusion
- Bone pain
- Hepatosplenomegaly/lymphadenopathy
- Testicular enlargement

Clinical Features of AML

- Gum hypertrophy
- Violaceous skin deposits
- Fatigue and breathlessness
- Infections
- Bleeding and bruising
- Hepatosplenomegaly
- Lymphadenopathy

Investigations

For Confirmation of Diagnosis

- Blood Count-Platelets and hemoglobin are usually low, White blood cell count is normally raised.
- Blood Film-Lineage of the disease can be identified by observing the blast cells. Auer rods can be seen in AML.
- Bone marrow aspiration-Reduced erythropoiesis, reduced megakaryocytes, and increased cellularity are the indicators to look for.
- Chest X-ray
- Cerebrospinal fluid examination
- Coagulation profile

For Planning Therapy

- Serum urate and liver biochemistry
- Electrocardiography/echocardiogram
- HLA type

- Check HBV status

Management

Untreated acute leukemia is usually fatal. But with palliative treatment, the lifespan can be extended. Curative treatments can sometimes be successful. Failure can be due to relapse of the disease or due to complications of the therapy or because of the nonresponsive nature of the disease. In ALL, remission induction can be done with combination chemotherapy of Vincristine. For high-risk patients, allogeneic stem cell transplantation can be performed.

Chronic Myeloid Leukemia

CML is a member of the family of myeloproliferative neoplasms which exclusively occur in adults. It is defined by the presence of the Philadelphia chromosome and has a more slowly progressive course than acute leukemia.

Clinical Features

- Symptomatic anemia
- Abdominal discomfort
- Weight loss
- Headache
- Bruising and bleeding
- Lymphadenopathy

Investigations

- Blood counts – Hemoglobin is low or normal. Platelets are low, normal or raised. WBC is raised.
- Presence of mature myeloid precursors in blood film
- Increased cellularity with increased myeloid precursors in bone marrow aspirate.

Management

First line drug in the treatment of CML is Imatinib(Glivec), which is a tyrosine kinase inhibitor. Second line treatments include chemotherapy with hydroxyurea, alpha interferon, and allogeneic stem cell transplantation.

Chronic Lymphocytic Leukemia

CLL is the most common leukemia that mostly occurs in old age. It is caused due to clonal expansion of small B lymphocytes.

Clinical Features

- Asymptomatic lymphocytosis
- Lymphadenopathy
- Marrow failure
- Hepatosplenomegaly
- B-symptoms

Investigations

- Very high white blood cell levels can be seen in blood counts
- Smudge cells can be seen in blood film

Management

Treatment is given to troublesome organomegaly, hemolytic episodes, and bone marrow suppression. Rituximab in combination with Fludarabine and cyclophosphamide show a dramatic response rate.

What are the similarities between Aplastic Anemia and Leukemia?

- Aplastic Anemia and Leukemia are hematological conditions.

What is the difference between Aplastic Anemia and Leukemia?

Aplastic Anemia vs Leukemia	
Leukemia can be defined as the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow.	Pancytopenia with hypercellularity(aplasia) of the bone marrow can be defined as aplastic anemia.
Location	
Abnormal cells are present in both blood and bone marrow.	Abnormal cells are not found either in blood or bone marrow.

Malignancy

This is a malignancy.

This is not a malignancy.

Summary – Aplastic Anemia and Leukemia

Leukemia is the accumulation of abnormal malignant monoclonal white blood cells in the bone marrow whereas aplastic anemia is the pancytopenia with hypercellularity of the bone marrow. This is the basic difference between aplastic anemia and leukemia. Early diagnosis and treatment of both these conditions are very much important to avoid life threatening complications.

References:

1. Kumar, Parveen J., and Michael L. Clark. Kumar & Clark clinical medicine. Edinburgh: W.B. Saunders, 2009. Print.

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